

Chhattisgarh Swami Vivekananda Technical University, Newai

Branch: Automobile Engg.

Subject: Design of Machine Elements

Total Theory Periods: 40

Class Tests: Two (Minimum)

ESE Duration: Four Hours

Course Code: C082512(037)

Total Tutorial Periods: 10

Assignments: Two (Minimum)

Maximum Marks: 100

Minimum Marks: 35

COURSE OBJECTIVES

- To familiarise the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT I

STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties -- Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and ‘C’ frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerberrelations

UNIT II

DESIGN OF SHAFTS AND COUPLINGS

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys, key ways and splines - Design of crankshafts -- Design of rigid and flexible couplings.

CLUTCHES

Friction clutches, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, centrifugal clutches.

UNIT III

DESIGN OF TEMPORARY AND PERMANENT JOINTS

Threaded fasteners - Design of bolted joints including eccentric loading, Knuckle joints, Cotter joints – Design of welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV

DESIGN OF ENERGY STORING ELEMENTS

Design of various types of springs, optimization of helical springs -- rubber springs -- Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V

DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS

Sliding contact and rolling contact bearings -- Design of hydrodynamic journal bearings, McKee's Eqn. Sommerfield Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings -- Design of Seals and Gaskets -- Design of Connecting Rod.

Note: (Use of P S G Design Data Book is permitted in the University examination)

TEXT BOOKS

1. Mechanical Engineering Design-Shigley J.E and Mischke C. R., Sixth Edition, Tata McGraw-Hill ,2003.
2. Design of Machine Elements -BhandariV.B,Second Edition, Tata McGraw-Hill Book Co,2007.

REFERENCES

1. Machine Design -SundararamoorthyT.V, Shanmugam.N,Anuradha Publications, Chennai,2003.
2. Machine Component Design -Orthwein W, Jaico Publishing Co,2003.
3. Mechanical Design – An Integral Approach -UguralA.C,McGraw-Hill BookCo,2004.
4. Design and Machine Elements -SpottsM.F., Shoup T.E, Pearson Education,2004.

STANDARDS

1. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearingsPart 1: Construction.
2. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2: Friction and Wear.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Automotive Electricals and Electronics
Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Semester: B.Tech – 5th
Course Code: C082511(082)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
Maximum Marks: 100
Minimum Marks: 35

COURSE OBJECTIVES

- To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical Systems like Batteries, Starting System, Charging System.
- To understand the operation and constructional details of various Automotive Electronic Systems like Ignition System, Lighting System and Dash – Board Instruments.
- To understand the functions of various lighting, meters and sensors etc.

UNIT -I

TYPES OF BATTERIES

Principle and construction of Lead Acid Battery, Nickel – Cadmium Battery, Nickel Metal, Hybrid Battery, Sodium Sulphur Battery and Aluminum Air Battery, Characteristics of Battery, Battery Rating, Capacity and Efficiency, Various Tests on Battery, Battery– Charging Techniques, .Maintenance of batteries

UNIT- II

ELECTRICAL COMPONENTS

Requirements of Starter Motor, Starter Motor types , construction and characteristics, Starter drive mechanisms, Starter Switches and Solenoids, Charging system components, Generators and Alternators ,types, construction and Characteristics Voltage and Current Regulation, Cut –out relays and regulators, Charging circuits for D.C. Generator, A.C. Single Phase and Three – Phase Alternators.

UNIT- III

IGNITION SYSTEMS

Battery Coil and Magneto–Ignition System, Circuit details and Components of Battery Coil and Magneto–Ignition System, Centrifugal and Vacuum Advance Mechanisms, Spark Plugs, Constructional details and Types.

UNIT- IV

ELECTRICAL AND ELECTRONIC IGNITION SYSTEMS

Electronically–Assisted and Full Electronic Ignition System, Non–Contact–type Ignition Triggering devices, Capacitive Discharge Ignition Distributor–less Ignition System, Digital Ignition System, Control Strategy of Electronic Ignition System.

UNIT -V

WIRING, LIGHTING AND OTHER INSTRUMENTS AND SENSORS

Automotive Wiring, Insulated and Earth Return System, Positive and Negative Earth Systems, Head Lamp and Indicator Lamp Details, Anti–Dazzling and Dipper Details, Electrical and Electronic Fuel Lift Pumps, Theory and Constructional Details of Dash Board Instruments and their Sensors like Speedometer, Odometer, Fuel Level Indicator Oil Pressure and Coolant Temperature Indicators, Horns and Wiper Mechanisms, Automotive Wiring Circuits

TEXT BOOKS

1. Automobile Electrical Equipments -Young, A.P. and Griffith, S.L.,ELBS and NewPress.
- 2 . Automobile Electrical Equipment,-Kholi .P.L, Tata McGraw-Hill co ltd, New Delhi, 2004

REFERENCES

1. Automobile Electrical Equipment- Crouse.W.H., McGraw Hill Book Co Inc. New York, 2005
2. Modern Electrical Equipments of Automobiles -Judge.A.W., Chapman & Hall, London 2004 .
3. Automobile Handbook -Robert Bosch, Bentley Publishers, 2004.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Dynamics of Machines
Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Semester: B.Tech – 5th
Course Code: C037514(037)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
Maximum Marks: 100
Minimum Marks: 35

Course Objectives:

- To study types of mechanical governors and to analyze its performance parameters To Apply the theory of balancing to rotating and reciprocating masses.
- To analyze gyro-effect on moving bodies
- To understand the concepts of mechanical vibration To perform inertia force analysis of machine elements
- To draw turning moment diagram of reciprocating engines
- To analyze performance parameters flywheel

UNIT I

Governors: Characteristics of centrifugal governors, Gravity controlled governors, Porter and proell. Spring controlled centrifugal governor: Hartung, & Hartnell governor. Performance parameter: Sensitivity, stability, Isochronisms, Governor Effort and power.

UNIT II

Balancing: Balancing of rotating masses, Static and dynamic balancing, Determination of balancing masses in two plane balancing, Balancing of internal combustion engines, Balancing of in-line engines, Firing order, Balancing of V-twin and radial engines, Forward and reverse crank method, Balancing of rotors.

UNIT III

Gyroscope: Gyroscopic forces and couple, gyroscopic effect in Airplanes, Ship motion and Vehicles moving on curved path.

UNIT IV

Mechanical Vibrations: One-dimensional, longitudinal, Transverse, and torsional vibrations, Natural frequency, Effect of damping on vibrations, Different types of damping. Forced vibration, Forces and displacement, Transmissibility, Vibration Isolation, Vibration sensors: seismometer and Accelerometers, Whirling of shafts with single rotor.

UNIT V

(a) Inertia force analysis: Effective force and inertia force on link, Inertia force on reciprocating engine. Inertia force in fourbar chainmechanism.

(b) Turning moment diagram and flywheel: Turning moment diagram for single and multi cylinder internal combustionengine, Coefficient of fluctuation of speed, Coefficient of fluctuation of energy, Flywheel.

Text Books

1. Theory of Machine- S.S.Rattan - Tata McGraw Hill, New Delhi
2. Theory of Machines - Thomas Bevan, - CBS/ Cengage Publishers

Reference Books

1. Theory of Machines and Mechanism– Uicker, Pennock, & Shigley – Oxford Univ. Press
2. Theory of Mechanisms and Machines- A. Ghosh, A. K. Mallik – EW Press.
3. Mechanism and Machine theory-Ambekar-PHI, Delhi
4. Theory of Machine – P.L. Ballaney – Khanna Publishers, New Delhi
5. Theory of Machine - Jagdish Lal- Metro Politan Books, New Delhi

Course Outcome

- Apply knowledge of Dynamics of machine for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts Dynamics of machine in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering Identify, analyze and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Operation Research
Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Semester: B.Tech – 5th
Course Code: C082513(037)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
Maximum Marks: 100
Minimum Marks: 35

NOTE:- Four Questions of 25 marks to be set, one from each unit.

Course Objectives:

- Understand definition, scope, objectives, phases, models & limitations of operations research.
- To understand different application areas of operations research like transportation problem, assignment model, sequencing models, dynamic programming, game theory, replacement models & inventory models

UNIT I

Introduction

Various stages of O.R, Fields of application, optimization and its classification.

General Linear Programming Problems- Introduction, maximization and minimization of function with or without Constraints, formulation of a linear programming problem, graphical method and simplex method, Big M method Degeneracy, application of L.P.P. in Mechanical Engineering.

UNIT – II

The Transportation Problems

Mathematical formulation computational procedures, Stepping stone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalanced transportation problems and case of Degeneracy.

The Assignment Problems

Mathematical formulation of assignment problems, solution of assignment problems, traveling salesman problems, Air crew Assignment problems.

UNIT - III

Waiting Line Theory

Basic queuing process, basic structure of queuing models, some commonly known queuing situations Kendall's service time, solution to M/M/1: ∞ /FCFS models.

Network Analysis

CPM/PERT, Network Representation, Techniques for drawing network. Resource smoothing and leveling, project cost, Optimum project duration, project crashing, updating, Time estimation in PERT.

UNIT – IV

Game Theory

Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists, when no saddle point exists, solution of $2 \times n$ and $m \times 2$ game.

Simulation

Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation, simulation of Inventory system, simulation of Queuing system.

Note: Four questions to be set, one from each unit.

Text Books

1. Operation Research , SasienYaspan
2. Operation Research – N. D. Vohra –TMH
3. Operation Research– Hira& Gupta – S. Chand &Co.

References

1. Operation Research – H. Gillette – TMH, NewDelhi
2. Operations Research – M. Taha – TMH, NewDelhi
3. Fundamentals of Operation Research – AckofSasieni – DhanpatRai&Sons
4. Quantitative Approach to Management – Lovin and Krit Patrick –TMH
5. Operation Research– S.D. Sharma – S. Chand & Com. NewDelhi

Course Outcomes:

- Identify and develop operational research models from the verbal description of the real system. Understand the mathematical tools that are needed to solve optimization problems.
- Use mathematical software to solve the proposed models.
- Develop a report that describes the model and the solving technique, analyze the results and propose
- Re-commendations in language understandable to the decision-making processes in Management Engineering.
- A student will be able use knowledge of operations research to solve transportation problems, assignment Problems, sequencing problems, dynamic programming & game theory.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Design of Machine Elements Lab
Total Lab Periods: 24
Maximum Marks: 40

Semester: B.Tech – 5th
Course Code: C037525(037)
Batch Size:30
Minimum Marks: 20

List of Experiments/Activities:

1. Select a daily use product and design the conceptual design by applying the design process taking the controlling parameters.
2. Make a list of mechanical components and know their materials and suggest some alternative materials for the each one of them.
3. Find a flange coupling in the college laboratory and justify its design by actual measurements.
4. Design a shaft used in some practical application, by actual working and loading conditions.
5. Justify the design of single plate clutch of an engine assembly
6. Design a connecting rod
 - a. Welded joints
 - b. Riveted and bolted joints

In addition, justify your findings.
7. Design of hydrodynamic journal bearings.
8. Design software in some high level language or excel sheets for design of a component.
9. **Mini Project:** Each student will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme , if needed. This will be done as home assignment to be submitted at the end of the semester.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Automobile Electrical & Electronics Lab
Total Lab Periods: 24
Maximum Marks: 40

Semester: B.Tech – 5th
Course Code: C082521(082)
Batch Size:30
Minimum Marks: 20

LIST OF EXPERIMENTS

a. Electrical Laboratory (Minimum three)

1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut –outs
4. Diagnosis of ignition system faults
5. Study of Automobile electrical wiring

b. Electronics Laboratory (Minimum Seven)

6. Study of rectifiers and filters
7. Study of logic gates, adder and flip-flops
8. Study of SCR and IC timer
9. Interfacing Sensors like RTD, LVDT, Load Cell etc.
10. Interfacing ADC for Data Acquisition
11. Interfacing DAC for Control Application
12. Interfacing A/D converter and simple data acquisition
13. Micro controller programming and interfacing
14. Interfacing Actuators
15. EPROM Programming
16. Fault Diagnosis of various sensors

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology

Semester: B.Tech – 5th

Branch: Automobile Engg.

Subject: Dynamics of Machines Laboratory

Course Code: C037522(037)

Total Lab Periods: 24

Batch Size:30

Maximum Marks: 40

Minimum Marks: 20

List of Experiments to be Performed (Minimum ten experiments are to be performed by each student)

1. To find out the oscillations of simple pendulum with universal vibration apparatus.
2. To find out the oscillations of Compound pendulum with universal vibration apparatus.
3. To find out the radius of gyration of bi-filler suspension with universal vibration apparatus.
4. To find out undamped torsional vibrations of single rotor system with universal vibration apparatus.
5. To find out the frequency of damped torsional vibration of single rotor system with universal vibration vibration apparatus.
6. To measure the frequency of torsional vibrations of single rotor system with universal vibration apparatus.
7. To measure the frequency of torsional vibrations of double rotor system with universal vibration apparatus.
8. To find out free vibration of helical coiled spring with universal vibration apparatus.
9. To study forced damped vibration of a spring mass system and simple supported beam with universal vibration apparatus.
10. To find out the Gyroscopic couple and prove the Gyroscopic law with Gyroscope apparatus.
11. To find out the Power and effort of Proel, Porter & Hartnell Governor with Governor Apparatus.
12. To find out the critical speed for different diameters of shaft by whirling of shaft apparatus.
13. To verify the static and dynamic balancing for different planes and masses by balancing apparatus.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Universal Vibration Apparatus
2. Whirling of Shaft Apparatus.
3. Balancing Apparatus (Both Static & Dynamic)
4. Epicyclic Gear Train and Holding Torque Apparatus
5. Gyroscope apparatus
6. Governor apparatus with differential attachments

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology

Branch: Automobile Engg.

Subject: Engine Auxiliary Systems

Total Theory Periods: 30

Class Tests: Two (Minimum)

ESE Duration: Three Hours

Semester: B.Tech – 5th

Course Code: C082531(082)

Total Tutorial Periods: Nil

Assignments: Two (Minimum)

Maximum Marks: 100

Minimum Marks: 35

UNIT I

CARBURETION

Properties of air-petrol mixtures, Mixture requirements for steady state and transient operation, Mixture formation studies of volatile fuels, design of elementary carburetor, Chokes, Effects of altitude on carburetion, Carburetor for 2-stroke and 4- stroke engines, carburetor systems for emission control.

UNIT II

GASOLINE INJECTION AND IGNITION SYSTEMS

Petrol Injection, Pneumatic and Electronic Fuel Injection Systems types. Ignition system requirements, Timing, Ignition Systems, breaker mechanism and spark plugs, Factors affecting energy requirement of the ignition system, factors affecting spark plug operation, Electronic Ignition Systems.

UNIT III

DIESEL FUEL INJECTION

Factors influencing fuel spray atomization, penetration and dispersion of diesel and heavy oils and their properties, rate and duration of injection, fuel line hydraulics, fuel pump, injectors, CRDI systems and its merits and demerits.

UNIT IV

MANIFOLDS AND MIXTURE DISTRIBUTION

Intake system components, Discharge coefficient, Pressure drop, Air filter, Intake manifold, Connecting pipe, Exhaust system components, Exhaust manifold and exhaust pipe, Spark arresters, Waste heat recovery, Exhaust mufflers, Type of mufflers, exhaust manifold expansion.

UNIT V

LUBRICATION AND COOLING SYSTEMS

Lubricants, lubricating systems, Lubrication of piston rings, bearings, oil consumption, Oil cooling. Heat transfer coefficients, liquid and air cooled engines, coolants, additives and lubricity improvers, concept of adiabatic engines.

Text Books:

1. Ramalingam ,K.K, Internal Combustion Engine, Scitech Publication(India)
2. Ganesan, V., Internal Combustion Engines, Tata McGraw-Hill Book Co.,1995.

References

1. Domkundwar, V.M, A Course in Internal Combustion Engines, Dhanpat Rai andCo.,1999.
2. Mathur,M.L., and Sharma,R.P., A Course in Internal Combustion Engines, Dhanpat Rai Publications (P) Ltd.,1998.
3. Duffy Smith, Auto Fuel Syststems, The Good Heart Willcox Company Inc.,Publishers,1987.
4. Edward F, Obert, Internal Combustion Engines and Air Pollution, Intext Education Publishers,1980.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Maintenance & Reliability
Total Theory Periods: 30
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Semester: B.Tech – 5th
Course Code: C082532(082)
Total Tutorial Periods: Nil
Assignments: Two (Minimum)
Maximum Marks: 100
Minimum Marks: 35

UNIT – I

Maintenance Engineering

Objective and functions, organization and administration, economics and maintenance policies. Types of maintenance systems-planned, unplanned, preventive, predictive, conditional monitoring, total predictive maintenance.

UNIT – II

Failure Analysis

Analysis of source identification, classification and selectivity of failures, catastrophic, wear out and cumulative failures, failure rate Mortality distribution, statistical and reliability concept of failure analysis, equipment replacement policy.

UNIT – III

Reliability Engineering

Concept, bath tub curve, elements, Hazard Models- constant, linearly increasing, weibull. System Reliability - Series configuration, parallel configuration, mixed configuration, reliability improvement – Improvement of components, Redundancy – element, unit, standby, repairable and non repairable systems, reliability, availability, maintainability, MTBF, MTTR, reliability allocation for simple series system.

UNIT – IV

Maintenance Management

Maintenance planning, maintenance scheduling, work orders, work measurement, maintenance cost budgeting, store and spare control, maintenance planning and control techniques, Incentives for maintenance work.

UNIT – V

Maintenance of Mechanical System

Introduction, Bearings, Friction Clutches, Couplings, Fastening Devices, Chains, Gear Drives, Support Equipment, Cooling Towers.

TEXT BOOKS

1. Maintenance Engineering & Management – R.C Mishra, K. Pathak – Prentice Hall of India, New Delhi
2. Maintenance Engineering – S. Shrivastava – S. Chand & Sons – New Delhi

REFERENCE BOOKS

1. Industrial Maintenance – H.P. Garg – S. Chand Publication, New Delhi
2. Maintenance Planning & Control – A. Kelly – TMH, New Delhi
3. Concept in Reliability – L.S. Srinath – Affiliated East-West Press, New Delhi

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program- Bachelor of Technology
Branch: Automobile Engg.
Subject: Vehicle Transport Management
Total Theory Periods: 30
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Semester: B.Tech – 5th
Course Code: C082533(082)
Total Tutorial Periods: Nil
Assignments: Two (Minimum)
Maximum Marks: 100
Minimum Marks: 35

UNIT - I

ORGANISATION AND MANAGEMENT

Forms of Ownership – principle of Transport Management-Staff administration –Recruitment and Training – welfare health and safety. Basic principles of supervising.Organizing time and people. Driver and mechanic hiring - Driver checklist - Lists for driver and mechanic - Trip leasing - Vehicle operation and types of operations.

UNIT - II

VEHICLE MAINTENANCE

Scheduled and unscheduled maintenance - Planning and scope - Evaluation of PMI programme – Work scheduling - Overtime - Breakdown analysis - Control of repair backlogs - Cost of options.

UNIT - III

VEHICLE PARTS, SUPPLY MANAGEMENT AND BUDGET

Cost of inventory - Balancing inventory cost against downtime - Parts control - Bin tag systems – Time management - Time record keeping - Budget activity - Capital expenditures - Classification of vehicle expenses
- Fleet management and data processing - Data processing systems - Software. Model - Computer controlling of fleet activity - Energy management.

UNIT – IV

SCHEDULING AND FARE STRUCTURE

Route planning - Scheduling of transport vehicles - Preparation of timetable – preparation of vehicle and crew schedule - Costs, fare structure – Fare concessions - Methods of fare collection - Preparation of fare table.

UNIT - V

MOTOR VEHICLE ACT

Schedules and sections - Registration of motor vehicles - Licensing of drivers and conductors - Control of permits - Limits of speed - traffic signs - Constructional regulations - Description of goods carrier, delivery van, tanker, tipper, municipal, fire fighting and break down service vehicle.

TEXT BOOK

1. John Dolu, *Fleet Management*, McGraw-Hill Co., 1984

REFERENCE BOOKS

1. Government Publication, *The Motor vehicle Act*, 1989.
2. Rex W Faulks, *Bus and Coach Operation*, Butterworth, 1987.
3. Kitchin.L.D., *Bus operation*, 3rd Edition, Illiffe and Sons Ltd., London, 1992.
4. Kadiyali.L.R., *Traffic engineering and Transport Planning*.

Chhattisgarh Swami Vivekanand Technical University, Bilhail

Name of the Program: **BTech**
Subject: **Environmental Studies**
Period per week (L-T-P): **(2-0-0) / Week**
Total Contact Hours: **40**

Semester: **V**
Code: **C000506(020)**
Non-Credit
No. of assignments to be submitted: **05**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:

1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

COURSE DETAILS:

UNIT I: Introduction to environmental studies, ecology and ecosystems (06 hours)

Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation (06 hours)

Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment (08 hours)

Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment (08 hours)

Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices (12 hours)

Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):

On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006). *Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006). *Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). *Fundamentals of Environmental Studies*, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005). *Ecology and Environment*. Rastogi Publications.

OPEN SOURCE LEARNING:

<http://nptel.ac.in/>